

Abstract

A method is provided for forming a power semiconductor device. The method begins by providing a substrate of a first conductivity type and then forming a voltage sustaining region on the substrate. The voltage sustaining region is formed by depositing an epitaxial layer of a first conductivity type on the substrate and forming at least one terraced trench in the epitaxial layer. The terraced trench has a plurality of portions that differ in width to define at least one annular ledge therebetween. A barrier material is deposited along the walls of the trench. A dopant of a second conductivity type is implanted through the barrier material lining the annular ledge and said trench bottom and into adjacent portions of the epitaxial layer. The dopant is diffused to form at least one annular doped region in the epitaxial layer and at least one other region located below the annular doped region. A filler material is deposited in the terraced trench to substantially fill the trench, thus completing the voltage sustaining region. At least one region of the second conductivity type is formed over the voltage sustaining region to define a junction therebetween.